PROCEEDING BOOK

1ST INTERNATIONAL CONFERENCE ON
EXPLORING INNOVATIVE SOLUTIONS FOR ENERGY AND WATER CHALLENGES FOR SUSTAINABILITY

(16-17 April, 2025)

Published by

Department of Petroleum & Natural Gas Engineering,
Mehran University of Engineering and Technology
SZAB Campus, Khairpur Mir's, Sindh, Pakistan

PROCEEDING BOOK OF 1ST INTERNATIONAL CONFERENCE ON EXPLORING INNOVATIVE SOLUTIONS FOR ENERGY AND WATER CHALLENGES FOR SUSTAINABILITY (ICEWS-2025)

PROCEEDING BOOK

1st International Conference on Exploring Innovative Solutions for Energy and Water Challenges for Sustainability

16-17 April 2025

"Unlock the Energy & Water Resources:
Meeting Marketing Demands"

ORGANIZED BY

DEPARTMENT OF PETROLEUM & NATURAL GAS ENGINEERING,
MEHRAN UNIVERSITY OF ENGINEERING AND TECHNOLOGY, SZAB CAMPUS,
KHAIRPUR MIR'S

IN COLLABORATION WITH

THE BENAZIR BHUTTO SHAHEED UNIVERSITY OF TECHNOLOGY AND SKILL DEVELOPMENT, KHAIRPUR MIR'S, &
THE SINDH HIGHER EDUCATION COMMISSION

www.icews.muetkhp.edu.pk

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Conference Overview

Theme: Unlock Energy and Water Resources: Meeting Market Demands

Recap and Preamble of the Conference

The 1st International Conference on Exploring Innovative Solutions for Energy and Water Challenges for Sustainability (ICEWS-2025) was successfully held from April 16–17, 2025, at Mehran University of Engineering and Technology, Shaheed Zulfiqar Ali Bhutto Campus, Khairpur Mir's, Pakistan. The conference was a landmark event aimed at bringing together global minds to tackle the dual crises of energy and water through innovative, sustainable, and interdisciplinary solutions.

The conference featured a vibrant inaugural session followed by thematic plenary sessions, culminating in a comprehensive concluding session. Each plenary session was centered around a critical theme addressing contemporary challenges and innovations in Energy and Water Sustainability. The core themes included: Unconventional Hydrocarbon Recovery, Water Resource Management and Treatment Technologies, Renewable Energy Integration, Policy, Innovation, and Industry-Academia Collaboration. These themes highlighted the interdisciplinary nature of the conference and underscored the interconnectedness of engineering, environmental science, and policy in achieving sustainability goals. Renowned scholars, researchers, and industry leaders from across the globe shared their cutting-edge research, best practices, and forward-thinking strategies, fostering rich discussions and offering diverse perspectives to shape future directions in energy and water solutions.

While the inaugural session was honored by the presence of Engr. Sikandar Ali Memon, Chief Operating Officer at Pakistan Petroleum Limited, as the Chief Guest, and Mr. Naveed Aslam, Regional Manager Sindh at Mari Energies, as the Guest of Honor, the event was further dignified by Prof. Dr. Dur Muhammad Pathan, Pro Vice-Chancellor, MUET, SZAB Campus, Khairpur Mir's. Both distinguished guests extended words of appreciation for the conference's vision of addressing pressing challenges in energy and water sustainability. The keynote speeches delivered by Prof. Dr. Rahisham Bin Abd Rehman from Universiti Tun Hussein Onn Malaysia and Dr. Yusufu Abeid Chande Jande from Nelson Mandela African Institution of Science, Tanzania, illuminated the audience on innovative approaches and interdisciplinary strategies essential for meeting future energy and water demands. To celebrate the successful inauguration and warmly welcome national and international participants, a Gala Dinner and Musical Night was organized on the evening of the first day, which featured cultural performances, exchange of souvenirs, and a vibrant networking atmosphere.

In today's rapidly evolving world, the complex challenges of energy insecurity, water scarcity, and resource inefficiency demand collaborative, sustainable, and forward-thinking solutions. The field of Water, Energy, Petroleum and Environmental Engineering, in tandem with water sciences and sustainable technologies, holds significant potential to address these critical issues. This international conference, themed "Unlock the Energy and Water Resources: Meeting Market Demands", aimed to bring together a broad coalition of experts, practitioners, industry leaders, and scholars to share breakthrough research, explore practical applications, and form synergistic partnerships across disciplines.

Recent developments in renewable energy, unconventional hydrocarbon recovery, wastewater treatment, and policy frameworks have revolutionized approaches to sustainable development. The intersections between these domains and industry need exceptional opportunities to implement innovative technologies and scalable solutions. As we move towards a more secure and resilient energy and water future, cross-sector collaboration is paramount. ICEWS 2025 provided a unique platform to engage diverse stakeholders—from academia and industry to government and R&D organizations—encouraging deep discussions, international knowledge exchange, and future partnerships.

The primary objective of ICEWS 2025 was to respond to the urgent national and global needs for sustainable resource management, market-driven energy solutions, water conservation, and technology integration. The conference themes were thoughtfully designed around four focal areas:

- Unconventional Hydrocarbon Recovery and Advanced Drilling Technologies
- Water Resource Management, Treatment & Sustainability
- Green and Renewable Energy Solutions
- Innovation, Policy Development, and Industry-Academia Collaboration

ICEWS-2025 organized by the Department of Petroleum & Natural Gas Engineering, SZAB Campus, Khairpur Mir's in collaboration with Benazir Bhutto Shaheed University of Technology and Skill Development, and generously sponsored by the Sindh Higher Education Commission, Oil and Gas Development Company Limited (OGDCL), and Pakistan Petroleum Limited (PPL), the conference marked a landmark step towards integrating knowledge and innovation to shape the future of sustainable energy and water resource management.

Inaugural Ceremony
Chief Guest
Engr. Sikandar Ali Memon **Chief Operating Officer, Pakistan Petroleum Limited**
Guest of Honor
Mr. Naveed Aslam **Regional Manager Sindh, Mari Energies Limited**

Steering Committee

S. No.	**Name**	**Designation**	**Responsibility**
1	Prof. Dr. Tauha Hussain Ali	Vice-Chancellor	Patron-in-Chief
2	Prof. Dr. Dur Muhammad Pathan	Pro Vice-Chancellor	Patron 1
3	Prof. Dr. Rasool Bux Mahar	Vice-Chancellor, BBSUTSD	Patron 2
4	Prof. Dr. Sayed Hyder Abbas Musavi	Director Academics	Member
5	Prof. Dr. Rafique Ahmed Memon	Director Administration	Member
6	Prof. Dr. Manthar Ali Keerio	Dean FOET, BBSUTSD	Member
7	Prof. Dr. Abdul Haque Tunio	Director PGS MUET,Jamshoro	Member
8	Dr. Asadullah Memon	Chairman P&NGE Dept:	Conference Chair

9	Dr. Aqeel Ahmed Bhutto	Chairman ME dept:	Conference Co- Chair
10	Dr. Ghulam Abbas	Assistant Professor	Conference Secretary
11	Engr. Abdul Samad Shaikh	Assistant Professor	Conference Co-Secretary
12	Engr. Imran Ali Memon	Assistant Professor	Member
13	Dr. Faisal Hussain Memon	Assistant Professor	Member
14	Engr. Sunder Sham Jeswani	Assistant Professor	Member
15	Syed Shoaib Ahmed Shah	Incharge Finance	Member
16	Engr. Tahir Soomro	Deputy Director MoE (Petroleum Div:) Islamabad	Member

Organizing Committee			
1	Dr. Asadullah Memon	Chairman P&NGE dept:	Conference Chair
2	Dr. Aqeel Ahmed Bhutto	Chairman ME dept:	Conference Co- Chair
3	Dr. Ghulam Abbas	Assistant Professor	Conference Secretary
4	Engr. Abdul Samad Shaikh	Assistant Professor	Conference Co-Secretary

5	Prof. Dr. Manthar Ali Keerio	Professor BBSUTSD	Member
6	Dr. Mujeeb Iqbal Soomro	Associate Professor	Member
7	Engr. Imran Ali Memon	Assistant Professor	Member
8	Dr. Faisal Hussain Memon	Assistant Professor	Member
9	Engr. Sunder Sham Jeswani	Assistant Professor	Member
10	Dr. Basheer Ahmed Dars	Assistant Professor	Member
11	Engr. Shoaib Ahmed Memon	Lecturer	Member
12	Engr. Abdul Wajid Shaikh	Senior Lab Engineer	Member
13	Engr. Umaid Ali	Lab Engineer	Member
14	Engr. Sohail Ahmed Shaikh	Lab Engineer	Member
15	Engr. Faheem Mumtaz Kalwar	Lab Engineer	Member
16	Engr. Khalique Wazir	Lecturer	Member
17	Engr. Asad Ahmed Memon	Lecturer	Member
18	Engr. Saif Ur Rahman	Lecturer	Member

Participants Details

Speakers/ Participants	
International Speakers	05
National Speakers	11
Research / Academician	60
Industry Expert/ Practicing Engineers	30
Distinguished Professors (National / International)	30
Students	200
Others	14

Closing Ceremony
Chief Guest
Prof. Dr. Rasool Bux Mahar Vice Chancellor Benazir Bhutto Shaheed University of Technology and Skill Development Khairpur Mir’s

Inaugural Ceremony

Summary of the Inaugural Session

The 1st International Conference on Exploring Innovative Solutions for Energy and Water Challenges for Sustainability (ICEWS-2025), hosted by the Department of Petroleum & Natural Gas Engineering, Mehran University of Engineering & Technology (MUET), Shaheed Zulfiqar Ali Bhutto Campus, Khairpur Mir's, commenced on April 16, 2025, with a grand inaugural ceremony that set the tone for two days of impactful dialogue, innovation, and collaboration.

The event was graced by esteemed dignitaries from academia, government, and industry. The Chief Guest, Engr. Sikandar Ali Memon, Chief Operating Officer, Pakistan Petroleum Limited, and the Guest of Honor, Mr. Naveed Aslam, Regional Manager Sindh, Mari Energies, were warmly welcomed along with senior university leadership, including Prof. Dr. Dur Muhammad Pathan, Pro Vice-Chancellor, MUET, SZAB Campus, and other distinguished faculty members and guests.

The ceremony began with the recitation of the Holy Quran by Mr. Siraj Ahmed, followed by the National Anthem. The Welcome Address was delivered by Dr. Asadullah Memon, Conference Chair and Chairman, Department of Petroleum & Natural Gas Engineering, who highlighted the significance of addressing energy and water challenges through research-led innovation, international collaboration, and academic-industry partnership.

A major highlight of the ceremony was the keynote speeches by the distinguished international speakers. Prof. Dr. Rahisham Bin Abd Rahman from Universiti Tun Hussein Onn Malaysia (UTHM), Malaysia, captivated the audience with his insights on the role of green hydrogen as a clean energy solution for decarbonizing industrial sectors. Dr. Yusufu Abeid Chande Jande from Nelson Mandela African Institution of Science, Tanzania, brought a unique perspective on water purification, combining traditional practices with modern innovation to offer sustainable, cost-effective solutions for water-scarce regions.

The keynote speeches were followed by the presentation of traditional Ajrak and shields by the Chief Guest, Pro Vice-Chancellor and conference chair, honoring the keynote speakers and special guests. In their addresses, both Engr. Sikandar Ali Memon and Prof. Dr. Dur Muhammad Pathan appreciated the initiative of MUET in organizing this much-needed interdisciplinary platform and encouraged continued efforts to tackle Pakistan's energy and water challenges.

The inaugural session concluded with a vote of thanks by Dr. Ghulam Abbas Qambrani, Conference Secretary, who acknowledged the generous support of the Sindh Higher Education Commission, sponsors OGDCL and PPL, and all collaborating institutions. He also expressed gratitude to the organizing team, faculty, volunteers, and students for their unwavering commitment. At the end of the opening ceremony, the chief guest and all other dignitaries proceeded to the press gallery for media talk followed by Hi Tea.

Inaugural Ceremony

Chief Guest, Engr. Sikandar Ali Memon, Chief Operating Officer, Pakistan Petroleum Limited (PPL) highlights ICEWS-2025.

The Chief Guest, Engr. Sikandar Ali Memon, Chief Operating Officer, Pakistan Petroleum Limited (PPL), delivered an inspiring address during the inaugural ceremony of the 1st International Conference on Exploring Innovative Solutions for Energy and Water Challenges for Sustainability (ICEWS-2025), held at MUET, SZAB Campus, Khairpur Mir's.

In his speech, Engr. Memon commended Mehran University for organizing a forward-looking and timely event focused on two of Pakistan's most pressing challenges—energy security and water sustainability. He emphasized the urgent need for interdisciplinary collaboration between academia, industry, and policymakers to tackle these complex issues with innovative and practical solutions.

Highlighting the importance of sustainable energy technologies, Engr. Memon underscored the transformative potential of renewables, hydrogen energy, and enhanced resource recovery methods in reshaping Pakistan's energy landscape. He further emphasized the role of advanced water management systems, reuse technologies, and smart infrastructure in achieving long-term water resilience.

Drawing from his extensive experience in the energy sector, he shared insights into the strategic importance of investing in research and development, and the role of young engineers and scientists in driving innovation. He stressed that academia-industry partnerships are essential to bridge the gap between theoretical knowledge and practical applications, encouraging institutions like MUET to continue fostering such collaborations.

Concluding his address, he expressed his appreciation for the vision behind ICEWS-2025 and congratulated the organizers for creating a valuable platform for international and national experts to share knowledge, explore solutions, and inspire future action. He hoped the conference would ignite lasting partnerships and contribute meaningfully to Pakistan's sustainable development agenda.

Prof. Dr. Muhammad Pathan, Pro Vice Chancellor of Mehran University of Engineering & Technology (MUET), SZAB Campus, Khairpur Highlights ICEWS-2025 and Welcome Address.

Prof. Dr. Muhammad Pathan, Pro Vice Chancellor of Mehran University of Engineering & Technology (MUET), SZAB Campus, Khairpur, delivered the welcome address at the 1st International Conference on Exploring Innovative Solutions for Energy and Water Challenges for Sustainability (ICEWS-2025). He warmly welcomed all international and national delegates, keynote speakers, researchers, students, and industry representatives to the event, appreciating their participation in what he described as a timely and vital platform for scientific exchange and collaboration.

In his opening remarks, Dr. Pathan emphasized the importance of organizing conferences like ICEWS to foster a culture of innovation, dialogue, and joint research in areas critical to Pakistan's development. He

	noted that energy and water are the twin pillars of sustainability, and addressing the complex challenges in these sectors requires interdisciplinary thinking, policy-level reforms, and the integration of emerging technologies. He highlighted that ICEWS-2025 exemplifies MUET's commitment to bringing together experts and thought leaders to formulate practical, sustainable, and scalable solutions to pressing national and global concerns. Dr. Pathan acknowledged the role of academia in not just producing research, but in driving societal impact through knowledge transfer, capacity building, and public-private partnerships. Throughout his address, he stressed the necessity of encouraging collaborative research among institutions, industries, and policy-makers, particularly in areas such as renewable energy systems, water conservation technologies, and smart infrastructure. He also pointed to the need for educational institutions to equip the next generation of engineers and scientists with problem-solving skills and a sustainability mindset. Concluding his speech, Prof. Dr. Muhammad Pathan expressed heartfelt gratitude to the organizing committee, partner institutions, and participants for making ICEWS-2025 a reality. He conveyed his optimism that the conference would spark transformative ideas, groundbreaking research, and strategic collaborations, ultimately contributing to a more resilient, resource-efficient, and sustainable future for Pakistan and the wider world.

	Dr. Asadullah Memon, Conference Chair of the 1st International Conference on Exploring Innovative Solutions for Energy and Water Challenges for Sustainability (ICEWS-2025), and chairman of Department of Petroleum & Natural Gas engineering Mehran UET, S.Z.A.B Campus, Khairpur Mirs provided a comprehensive overview of the event's scope and impact. He emphasized the conference’s central objective: to bring together global experts, researchers, industry professionals, and policymakers to address critical energy and water sustainability challenges through interdisciplinary collaboration and innovation. He reported that a total of **117 research papers** were submitted from various national and international institutions. After a rigorous peer-review process, **56 high-quality papers** were selected for presentation, reflecting the conference’s strong academic and technical standards. The two-day event featured **10 parallel technical sessions**, strategically organized to maximize engagement and knowledge exchange across thematic areas such as renewable energy, water treatment technologies, sustainable development, environmental engineering, smart agriculture, and integrated policy frameworks. Dr. Memon highlighted the importance of the conference in fostering academia-industry partnerships, promoting applied research, and engaging young scholars in meaningful discourse. He also expressed his appreciation to the scientific committee, reviewers, sponsors, and organizing team for their dedication and efforts in making ICEWS-2025 a successful and impactful academic platform.

	Keynote Speech **Assoc Prof Ir. Ts. Dr. Rahisham Abd Rahman** **Universiti Teknologi Malaysia (UTM), Malaysia** Prof. Dr. Rahisam Bin Abd Rahman from Universiti Teknologi Malaysia delivered an insightful keynote address centered on the transformative potential of green hydrogen in the global energy transition. He emphasized green hydrogen as a cornerstone of future clean energy systems, capable of significantly reducing carbon emissions across energy-intensive sectors such as transportation, manufacturing, and power generation. In his address, he discussed the technological advancements driving the production, storage, and utilization of green hydrogen, including electrolyzer efficiency, renewable integration, and hydrogen fuel cell innovations. He also highlighted the critical role of policy frameworks, cross-sectoral collaboration, and regional partnerships in creating viable hydrogen economies, particularly in Southeast Asia. Dr. Rahisam underscored the importance of sustainability, scalability, and affordability, calling on researchers and engineers to accelerate innovation and pilot deployment. He also pointed to Malaysia's roadmap for green hydrogen and its potential to become a regional hub for clean energy technologies.
	Keynote Speech **Dr. Yusufu Abeid Chande Jande** **Associate Professor, Materials Science and Engineering, Nelson Mandela African Institution of Science and Technology, Tanzania**

	Dr. Yusufu Abeid Chande Jande delivered a powerful keynote address highlighting the urgent need for innovative solutions in water purification and sustainable water management. Drawing attention to the global water crisis, he emphasized how access to clean and safe drinking water remains a significant challenge, particularly in developing countries. His address focused on recent advancements in membrane filtration, nanotechnology-based purifiers, and solar-powered desalination systems that offer cost-effective and energy-efficient solutions for water treatment. He also shed light on emerging materials such as graphene-based membranes and bio-inspired filtration systems that can significantly enhance water purification performance. Dr. Jande underscored the importance of community-level implementation, stressing that research must be translated into practical technologies suitable for rural and low-resource environments. He highlighted successful case studies from East Africa, where localized purification systems have improved health outcomes and resilience against water scarcity.
	Vote of Thanks **Dr. Ghulam Abbas,** **Conference Secretary, ICEWS-2025** Dr. Ghulam Abbas, Conference Secretary of ICEWS-2025, concluded the inaugural ceremony with a warm and heartfelt vote of thanks, extending his sincere appreciation to the esteemed speakers, distinguished guests, participants, and the organizing committee for their invaluable contributions to the success of the conference.

	He acknowledged the depth and quality of the discussions, the spirit of collaboration fostered throughout the sessions, and the unwavering dedication of everyone involved. He emphasized the pivotal role of research, innovation, and interdisciplinary exchange in addressing today's global energy and water challenges. Dr. Abbas also praised the meticulous efforts of the organizing team, student volunteers, and supporting staff whose commitment ensured the smooth execution of the event. He encouraged all attendees to build on the knowledge and networks gained during the conference for their academic, professional, and societal advancement. With his gracious and optimistic remarks, the vote of thanks marked a fitting close to the ceremony, setting an enthusiastic tone for the sessions ahead and reinforcing the shared commitment to a sustainable and innovative future.

International Speakers

Dr. Rahisham Bin Abd Rahman

Associate Professor and Deputy Dean at the Center of Graduate Studies, Universiti Tun Hussein Onn Malaysia (UTHM). Ph.D. in High Voltage Engineering and an M.Eng. in Electrical and Electronic Engineering from Cardiff University, UK. With over a decade of experience in academia and industry, his research focuses on dielectric materials, high-voltage insulation systems, grounding, and lightning protection.

Dr. Yusufu Abeid Chande Jande Associate Professor of Material Science and Engineering and deputy Center Leader, WISE-Futures center at the Nelson Mandela African Institution of Science and Tanzania. Dr. Jande holds PhD degree in Mechanical Engineering from Ansan, South Korea. His research area focuses on capacitive deionization for desalination and CO2 capture and rapid prototyping specifically in producing uniformly porous and graded porous structures using selective laser sintering (SLS) and producing composite materials from porous structures manufactured using SLS.	
Prof. Dr. Vishnu Prasad Pandey Professor with the Department of Civil Engineering and Director at the Center for Applied Research and Development (CARD), Institute of Engineering (IOE), Tribhuvan University, Nepal. Dr. Vishnu holds a Ph.D. in Integrated River Basin Management from the University of Yamanashi, Japan. Dr. Vishnu has extensive professional and academic experience, having been involved in various research and professional projects in Nepal and abroad. He has made significant contributions to advancing research and academics in the field of water resources. His expertise includes sustainable water management, climate change impacts on hydrological systems, and innovative solutions for water conservation and flood mitigation, with a focus on hydrology, water resources, and climate change impact assessment and adaptation.	
Prof. Dr. Nasir Golsanami Professor at the College of Energy and Mining Engineering of Shandong University of Science and Technology, China. He is the winner of the "Talented	

Young Scientists Program", Director of the "China-Iran Science and Technology Office", "Outstanding Foreign Expert in the Education System of Shandong Province", winner of the "Excellent Presenter Award", Honorary Professor at SCO, winner of the "Qilu Friendship Award", "Honorary Citizen of Shandong Province", etc. Naser's research work focuses on the interdisciplinary studies of Geomechanics, Rock Mechanics, and Rock Physics of Unconventional Oil and Gas Reservoirs, Natural Gas Hydrate Reservoirs, Deep Coalbed Methane Reservoirs, and Geothermal Reservoirs with Artificial Intelligence, Big Data and Data Mining, Digital Rock Analysis, and 2D Nuclear Magnetic Resonance Technology, etc. He has published more than 60 SCI (ISI) papers in internationally recognized top journals. He has been granted 8 invention patents.	
Dr. Muhammad Wajid Saleem Senior Lecturer in the Mechanical and Energy Engineering Department and the Program Lead for the MSc Energy and Sustainable Development program at De Montfort University, UK (Dubai Campus). He earned his Ph.D. in Mechanical Engineering from Hanyang University, South Korea. Dr. Wajid's research focuses on the Water-Energy Nexus, with key interests in salinity gradient energy, solar energy applications, water desalination, and sustainable development. His work contributes to advancing energy-efficient solutions for global water and energy challenges.	

National Speakers

Prof. Dr. Muhammad Sagir Dean of all faculties at Khwaja Fareed University of Engineering and Information Technology (KFUEIT), Rahim Yar Khan, Pakistan, and Director of the Rajanpur Campus, KFUEIT. Dr. Sagir holds PhD in Chemical Engineering from Universiti Teknologi Petronas (UTP), Malaysia. His research expertise includes Enhanced Oil Recovery (EOR), specifically surfactant and polymer flooding, development of advanced materials for energy and wastewater treatment, photo-catalysis, and sustainable energy solutions.	
Prof. Dr. Amir Mahmood Soomro Professor of Department of Electrical Engineering at Mehran University of Engineering and Technology, Jamshoro, Pakistan. He holds a Ph.D. in Electrical Engineering from the School of Automation, Beijing Institute of Technology, P. R. China. Dr. His research focuses on Power Electronics, Control engineering and Renewable Energy. In addition to the Electrical Engineering, he has got internationally recognized Health, Safety and Environment (HSE) certifications and qualifications form USA and UK based institutes and boards i.e. OSHA, NEBOSH and IOSH.	

Dr. Sajid Hussain Siyal Associate Professor and Chairman of the Department of Metallurgy and Materials Engineering at Dawood University of Engineering and Technology (DUET), Karachi, Pakistan. He holds a Ph.D. in Materials Science and Engineering from the Advanced Composite Center, State Key Laboratory of Organic-Inorganic Composites, Beijing University of Chemical Technology, China. With over a decade of experience in academia and research, Dr. Siyal has made significant contributions to the field of materials science. His research focuses on energy storage devices, lithium-ion batteries, and nanocomposite materials.	
Dr. Yasir Niaz Associate Dean of the Faculty of Mechanical and Agricultural Engineering and the Head of the Department of Agricultural Engineering at Khwaja Fareed University of Engineering and Information Technology, Pakistan. He holds a Ph.D. in Environmental Engineering from Dalian University of Technology, Dalian, China. Dr. Yasir expertise lies in Environmental Engineering and Management, with a focus on Air Pollution Monitoring and Control.	
Dr. Dur Muhammad Soomro Associate Professor of Department of Electrical Engineering at DHA Suffa University Karachi, Pakistan. He is an accomplished electrical engineering professional with over 34 years of experience spanning academia, research, and industry. He has published 26 journal articles, 27 conference papers, 1 book chapter, 2 lab modules, and 1 teaching module. His research focuses on power system stability, renewable energy	

integration, power quality, and artificial intelligence applications in electrical engineering.	
Syed Tariq Hasany Mr. Tariq is a seasoned geoscientist and exploration leader specializing in subsurface technologies, unconventional resources, and digital transformation. He is currently a leader in the Petroleum Engineering Consulting Group, Karachi, Pakistan, with 34 years of global experience in the oil and gas industry. Throughout his extensive career, Mr. Tariq has worked across Pakistan, Malaysia, Argentina, Central Asia, and the Middle East, delivering impactful results in both conventional and unconventional exploration. With a proven track record of managing multi-million-dollar exploration budgets and leading cross-functional teams, he has played a key role in advancing exploration strategies and optimizing hydrocarbon resource development.	
Dr. Kashif Hussain Mangi A distinguished researcher and educator recognized for his interdisciplinary contributions to renewable energy systems, CO_2 management, and sustainable water solutions. He currently serves as an Academician specializing in Energy Management, Engineering Management, and Sustainability at the Berlin School of Business and Innovation, Germany. He holds a Ph.D. in Process and Bioprocess Engineering from the University of Nantes, France. His research focuses on Solar Thermal Engineering, Heat and Mass Transfer, and Renewable Energy.	

Engr. Tahir Soomro

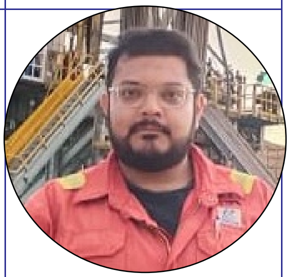
Deputy Director and Oil Sector Coordinator at the Ministry of Energy (Petroleum Division), Government of Pakistan. Mr. Tahir is involved in overseeing and managing key aspects of Pakistan's oil sector, ensuring efficient policy implementation, regulatory compliance, and strategic planning. He holds a B.E. in Petroleum & Natural Gas Engineering from MUET SZAB Campus, Khairpur Mir's.

Engr. Muzaffar Ali

Deputy Chief Engineer (Production) at Pakistan Petroleum Limited, Karachi, Pakistan. Muzaffar Ali Mahar is a seasoned petroleum engineer with over 12 years of expertise in oil and gas production operations. He holds master's degree in petroleum engineering from the University of Calgary, Canada and specializes in production optimization, well completions, stimulation, testing, and reservoir surveillance. He has led strategic production planning, rig-less well interventions, and technical evaluations for downhole equipment. With certifications such as IWCF Level-4 (Well Interventions) and proficiency in industry-standard software, Muzaffar brings a strong problem-solving mindset, technical acumen, and leadership capabilities to optimize hydrocarbon recovery efficiently.

Engr. Muhammad Furqan Qureshi

Senior Engineer at Rutledge Omni Services PTE LTD, Singapore specializing in occupational health, process safety, and environmental sustainability. He holds a master's degree in Petroleum Engineering from MUET, Jamshoro, and is currently pursuing a PhD at the same institute. His research focuses on nanofluid applications



for wettability alteration, hydrogen geo-storage, and circular economy-driven solutions for the oil and gas sector. With expertise in risk mitigation and advanced reservoir engineering, he has played a pivotal role in developing and implementing high-impact safety frameworks for complex drilling and production operations.	
Engr. Omer Ahsan Senior Petroleum Engineer (Well Operations) at Mari Energies Limited (formerly MPCL). He holds a bachelor's degree in petroleum engineering from NED University of Engineering and Technology and has 10 years of diverse experience in the oil and gas industry. He has served in key roles, including Production Engineer-I and Well Operations Engineer-II, leading major projects such as the Pressure Enhancement Facility (PEF) and field development initiatives. Beyond his technical contributions, he actively mentors' young engineers and shares industry insights to foster innovation and operational excellence.	

Plenary Sessions

(Session 1A of Day 1)

Session Chair: Dr. Rahisam Bin Abd Rahman

Session Secretary: Prof. Dr. Amir Mahmood Soomro

Session Theme: Next-Generation Energy Solutions: Unlocking the Potential of Hydrogen and Geothermal solutions

Plenary Talk-1:
Assoc Prof Ir. Ts. Dr. Rahisham Abd Rahman Universiti Teknologi Malaysia (UTM), Malaysia
Title: Green Hydrogen: Unlocking the Future of Clean Energy

Abstract:

Green hydrogen is increasingly recognized as a key enabler of the global clean energy transition. Produced through electrolysis powered by renewable energy sources, it offers a sustainable alternative to fossil fuels with applications in power generation, transportation, and industrial processes. Despite its potential, challenges remain in areas such as cost-effectiveness, large-scale production, infrastructure readiness, and policy support. Recent advancements in electrolysis efficiency, hydrogen storage, and distribution technologies are driving its feasibility as a mainstream energy solution. In Southeast Asia, countries including Malaysia are positioning themselves as emerging hubs for green hydrogen development, leveraging abundant solar and hydropower resources. The integration of green hydrogen into national energy strategies has the potential to enhance energy security, reduce carbon emissions, and support long-term sustainability goals. A critical

examination of current developments, technological breakthroughs, and policy frameworks provides valuable insights into the role of green hydrogen in shaping the future energy landscape.

Takeaway of the Talk:

- Green hydrogen, produced via renewable-powered electrolysis, is a promising zero-emission fuel for power, transportation, and industry.
- Recent advancements in electrolysis efficiency, storage, and distribution are making green hydrogen more viable at scale.
- Southeast Asian nations, particularly Malaysia, are emerging as key players by harnessing solar and hydropower potential.
- Integrating green hydrogen into national energy strategies can boost energy security, reduce carbon footprints, and support sustainability objectives.
- Overcoming cost, infrastructure, and regulatory hurdles is essential for unlocking green hydrogen’s full potential.

Plenary Talk-2:

Prof. Dr. Amir Mahmood Soomro
Professor of Department of Electrical Engineering,
Mehran University of Engineering and Technology, Jamshoro

Title: An Engineering Approach to Generate Electrical Energy from Geothermal Heat Trapped in Oil and Gas Reservoirs

Abstract:

Sindh province is facing an energy crisis and weak energy management but rich with geothermal energy. However, the issue of energy crisis is serious across Pakistan but the districts with high mobile areas are dealing with crisis in deep impact. Therefore, this study is proposed to find ways to tap into the heat from oil and gas reservoirs to improve energy mix at national level. This research deep dives into how technically possible, cost-effective, and environmentally friendly this approach is. By practicing this, it is expected to offer a sustainable and innovative energy source that lessens our dependence on traditional fossil fuels and helps make Pakistan's energy supply more diverse and stable. The methodology of this study included lab experiments using a PVT analyzer to measure the heat potential extractable from hot oil and gas reservoirs. Additionally, a MATLAB-based simulation model was developed to estimate the enhancement in Pakistan's energy mix. The combination of experimental data, mathematical modeling, and simulation provided a comprehensive analysis of the feasibility and impact of proposed energy solution.

The outcomes of this suggest that from a 130°C hot reservoir producing 1500 barrels of hot water daily, approximately 10.5×10^7kJ of heat energy

can be extracted each day. When converted to electricity with a typical efficiency of 10%, this equates to around $10.5\text{x}10^7$kJ kJ or 2,918 kWh of electrical energy daily. Given that the average household in Pakistan consumes about 150 kWh of electricity per month (5 kWh per day), this setup could power approximately 583 households. Assuming an average household size of five people, approximately 2,915 individuals will enjoy this. This method, which is novel and very important because it allows significant amounts of electricity to be generated from a resource that had not been tapped into before, also assists in easing the energy crisis in Pakistan. By reducing dependency on conventional fossil fuels and filling up the energy mix with sustainable sources, this approach provides a significant increase in energy security and accessibility thus benefiting thousands of people.

Takeaway of the Talk:

Harnessing geothermal heat from oil and gas reservoirs presents a novel, sustainable solution to Pakistan's energy crisis, particularly in high-need districts like those in Sindh.

A 130°C reservoir producing 1500 barrels of hot water daily can generate approximately 2,918 kWh—enough to power nearly 583 households or benefit over 2,900 people.

This approach diversifies the national energy mix, reduces reliance on conventional fossil fuels, and enhances energy security.

With further development, this engineering method could be scaled to benefit thousands more, promoting cleaner, more stable energy infrastructure in Pakistan.

(Session 1B of Day 1)

Session Chair: Dr. Yasir Niaz

Session Secretary: Dr. Ghulam Shabir Solangi

Session Theme: Advancing Water and Energy Security through Technological Innovations

Plenary Talk-1:
Prof. Dr. Vishnu Prasad Pandey Professor, Department of Civil Tribhuvan University, Nepal
Title: Conjunctive Management of Water Resources as a Solution for Water and Energy Challenges

Abstract:

Water and energy challenges constrain irrigation supply, food production and food security in many agrarian regions across the globe. They are further aggravated by climate variability and change. Appropriate planning and implementation of strategies for conjunctive management (CM) of surface and groundwater resources could offer a solution to address part of the challenges. While there is generic understanding of conjunctive use, in many instances such practices are happening without planning, a thorough CM planning is yet to realize in many command areas. In this context, this keynote presents a holistic framework for assessing CM and implementation prospects from a system-level perspective with a case of Southern Plain in Western Nepal and discusses its wider implications to other regions such as in Pakistan. Results of demonstration of the framework in the case study area in Nepal shows that knowledge of water resources availability is good and that of water demand low. Additional and coordinated investments are required to

improve knowledge gaps as well as access to irrigation. There is therefore a need to assess water resources availability, water access, use and productivity, to fill the knowledge gaps in order to pave pathways for CM. Further, this talk also discusses some strategies to translate prospects of conjunctive management into implementation.

Takeaway of the Talk:

- Conjunctive management (CM) of surface and groundwater offers a promising strategy to address water and energy challenges in agriculture-dominated regions.
- A holistic assessment framework demonstrated in Southern Plains of Western Nepal reveals the importance of aligning water availability with demand through coordinated planning.
- Improved data on water access, use, and productivity is critical for effective CM implementation.
- Lessons from Nepal’s case study offer valuable insights for similar water-stressed areas, including regions in Pakistan.
- Strategic investments, stakeholder coordination, and informed decision-making are essential to realize the full potential of conjunctive water resource management.

Plenary Talk-2:
Dr. Sajid Hussain Siyal Associate Professor, Department of Metallurgy and Materials Engineering Dawood University of Engineering and Technology (DUET), Karachi
Title: UV-Assisted Synthesis and Characterization of Nano-Ceramic Filler Composite Electrolytes for Metal Battery Energy Storage.

Abstract:

Lithium-metal batteries (LMBs) are promising energy storage devices due to the high capacity and minimum negative electrochemical potential. Their concrete applications remain disturbed by unbalanced electrolyte-electrode interfaces, limited electrochemical window, and high-risk. Herein, a novel strategy to prepare ceramic-based electrolyte that possess great potential in energy storage due to their higher level of energy densities in LMBs. lanthanum titanate (LTO) and Aluminum Titanium Phosphate (LTP) film developed via the UV system, aimed to prepare flexible Li+ interpenetrating network film to integrate the ceramic structure with polymer to yield the free-standing electrolyte film for better battery safety and desired interfacial stability. The electrolyte presented satisfactory electrochemical performance, including good ionic conductivity, large transference number, and wide electrochemical stability window (ESW) at room temperature. The fundamental function of nano fillers is to support building a stable (SEI) and limits the growth of dendrites. Thus, prepared ceramic-based electrolytes effectively renders to inhibit lithium dendrite growth in a symmetrical cell during charge/discharge at a current density of 2 mA/cm2 above standards without short-circuiting at room temperature. The battery assembled that exhibits superior cyclic stability with high columbic efficiency. This

work recommends that the structures of Li-ion conductor help to design a prime solution of promising electrolyte for high-performance applications.

Takeaway of the Talk:

- A novel ceramic-based electrolyte film integrating lanthanum titanate (LTO) and aluminum titanium phosphate (LTP) via a UV-assisted process enhances the performance and safety of lithium-metal batteries (LMBs).
- The developed electrolyte demonstrates excellent ionic conductivity, a high lithium-ion transference number, and a wide electrochemical stability window at room temperature.
- The flexible Li^+-conductive film improves electrode-electrolyte interface stability and effectively inhibits lithium dendrite growth, even under high current density (2 mA/cm^2), reducing the risk of short-circuiting.
- Nano-fillers within the ceramic structure promote stable solid electrolyte interphase (SEI) formation, crucial for long-term battery performance.
- This approach offers a promising pathway for designing safe, high-performance electrolytes for next-generation energy storage systems.

(Session 1C of Day 1)

Session Chair: Prof. Dr. Muhammad Khan Memon

Session Secretary: Engr. Omer Ahsan

Session Theme: The Future of Water Treatment: and hydrocarbons innovation for Renewable Energy

Plenary Talk-1:
Dr. Muhammad Wajid Saleem Senior Lecturer,Mechanical and Energy Engineering Department De Montfort University, UK, Dubai Campus
Title: Driving Sustainability in Water Purification: The Role of Integrated CDI and Salinity Gradient power Systems

Abstract:

The escalating global water demand and diminishing freshwater resources necessitate sustainable desalination technologies. Water scarcity leads to significant challenges worldwide. Capacitive deionization (CDI) has emerged as an energy-efficient electrochemical method for purifying low-salinity water. This study addresses the performance improvement of CDI system by integrating it with salinity gradient power generation (SGP) technologies, including pressure-retarded osmosis (PRO), reverse electro dialysis (RED), and capacitive donnan potential (CDP), to reduce overall energy consumption. The core objective is to partially recover the energy utilized in desalination by using the salinity gradient produced during the CDI process.

To achieve this, a multi-pass desorption method in CDI was employed to generate a higher concentration gradient in the rejected brine. This concentrated effluent serves as an effective feed for SGP systems. Key

findings reveal significant energy savings through process integration. For instance, integrating CDI with CDP reduced energy consumption for water production from 1.4 kJ/l to 0.35 kJ/l, a saving of approximately 75%. Similarly, the integration of CDI with PRO resulted in a decrease in energy consumption from 2.2 kJ/l to 0.67 kJ/l, representing an energy saving of about 69.5%. Furthermore, in CDI-RED energy consumption of 1.5 kJ/l was reduced to 0.58 kJ/l.

In conclusion, the integration of CDI with SGP systems, presents a valuable and insightful approach towards significantly reducing the energy footprint of desalination, fostering more sustainable water purification practices and mitigating environmental concerns associated with energy-intensive desalination processes and brine disposal. Moreover, this innovative multi-pass approach adopted for CDI integration with SGP systems has also improved the water recovery of the system, reaching about 90%, compared to the 50% of a simple CDI system.

Takeaway of the Talk:

- Combining CDI with salinity gradient power (SGP) technologies—such as CDP, PRO, and RED—dramatically enhances energy efficiency in desalination.
- Integration with SGP systems reduced energy consumption by up to 75%, e.g., CDI-CDP lowered energy use from 1.4 kJ/L to 0.35 kJ/L, and CDI-PRO achieved 69.5% savings.
- A multi-pass desorption approach in CDI increased water recovery rates from 50% to 90%, enhancing system performance.

- This method offers a promising route to reduce environmental impact and brine disposal concerns while supporting global freshwater needs.
- The synergistic use of energy recovery from salinity gradients makes this approach viable for sustainable large-scale water purification.

Plenary Talk-2:
Engr. Omer Ahsan Senior Petroleum Engineer, Mari Energies Limited, Pakistan
Title: Risk Management in Petroleum Engineering

In petroleum engineering, effective risk assessment and management are essential to ensure operational safety, environmental protection, and economic viability. As oil and gas fields mature, they often experience increased production of produced water (PW), which presents significant challenges in handling and disposal. This issue is particularly pronounced in late-life gas fields, where elevated water production can lead to reduced hydrocarbon recovery, increased operational costs, and heightened environmental risks. The management of produced water in aging gas fields encompasses several challenges, including the safe disposal of large volumes of water, prevention of reservoir damage, and compliance with environmental regulations. Traditional disposal methods, such as evaporation ponds and deep well injections, require thorough risk assessments to address potential issues like groundwater contamination and induced seismicity. Drilling injector wells, for instance, involves evaluating geological stability, well integrity, and the potential for seismic events. Combination of evaporation ponds and produced water injections through dedicated injector wells. The drilling of these wells necessitates comprehensive risk assessments to ensure proper casing design, cementing practices, and monitoring systems are in place to mitigate potential hazards. Challenges include managing the integrity of aging infrastructure and ensuring the long-term sustainability of disposal methods. These include drilling additional injection wells and implementing advanced treatment processes to facilitate the reuse of produced water. Treatment methods under consideration involve coagulation and flocculation to remove suspended solids, activated carbon filtration to eliminate organic contaminants, and membrane technologies such as ultrafiltration, nanofiltration, and reverse osmosis to achieve high-quality water suitable for reuse in drilling fluids and acid stimulation operations. These approaches aim to reduce freshwater consumption, minimize environmental impact, and promote sustainable resource utilization.

By integrating comprehensive risk assessments with advanced treatment technologies, we aim to address the challenges associated with produced water in late-life gas fields effectively. This holistic approach ensures operational efficiency, environmental stewardship, and the sustainable management of water resources in the petroleum industry.

Takeaway of the Talk:

- Effective risk assessment is vital for handling produced water in aging gas fields, addressing challenges like reservoir damage, seismicity, and environmental compliance.
- Combining evaporation ponds with injector wells offers a feasible solution, requiring rigorous geological and infrastructure evaluations to ensure safe operations.
- Technologies like coagulation, activated carbon filtration, and membrane processes enable the reuse of produced water, supporting reduced freshwater dependency.
- Emphasis on water reuse in drilling and stimulation operations contributes to long-term environmental stewardship and resource efficiency.

- Integrating risk assessments with treatment technologies ensures operational safety, cost control, and sustainable produced water management in petroleum engineering.

(Session 2A of Day 1)

Session Chair: Prof. Dr. Muhammad Sagir

Session Secretary: Dr. Ghulam Abbas

Session Theme: Strengthening Pakistan's Energy Future: Strategic Approaches in EOR and Energy Security

Plenary Talk-1:
Prof. Dr. Muhammad Sagir Professor and Dean of all faculties Khwaja Fareed University of Engineering and Information Technology (KFUEIT) Rahim Yar Khan.
Title: Scope of Enhanced Oil Recovery (EOR), Especially in Pakistan

Abstract:

The necessity for effective hydrocarbon recovery techniques has grown as global energy requirements continue to rise. In order to maximize the utilization of resources, increasing the recovery factor, and prolong the productive life of established oil fields, enhanced oil recovery (EOR) techniques are essential. EOR includes gas, chemical, and thermal injection techniques, all of which are intended to increase reservoir sweep and oil displacement efficiency. Despite the fact that these technologies have been widely adopted globally, Pakistan has yet to adopt them because of infrastructure, financial, and technical limitations.

Pakistan has enormous potential for EOR deployment in spite of these obstacles. The nation has a number of established oil fields where EOR can greatly increase recovery rates, including those in the Potwar Basin, Lower Indus Basin and Upper Indus Basin. Because industrial CO_2 emissions can be recycled for oil recovery while having a smaller

environmental impact, CO_2 injection is especially promising. Onshore fields with deteriorating waterflood performance have also demonstrated the viability of polymer flooding. The absence of specialized knowledge, significant capital expenditures, and technological constraints continue to prevent wider use. Pakistan's oil industry can expedite the adoption of EOR by establishing prototype EOR projects, encouraging industry-academia collaboration, and providing incentives for international investments.

The role of EOR in Pakistan will be thoroughly discussed in the presentation, which will address policy frameworks, technical viability, economic viability, and international best practices. Additionally, a plan for integrating EOR technology into Pakistan's upstream oil industry will be developed, emphasizing the need for government support, industry collaboration, and research and development expenditures. Pakistan may improve its energy security, lessen its reliance on imports, and guarantee sustainable hydrocarbon output for years to come by utilizing EOR.

Takeaway of the Talk:

- Enhanced Oil Recovery (EOR) is vital to increasing recovery factors, extending field life, and meeting rising energy demands globally and in Pakistan.
- Pakistan's mature fields—particularly in the Potwar, Lower Indus, and Upper Indus Basins—present strong opportunities for EOR application despite current underutilization.
- : CO_2 injection and polymer flooding show high potential for local application, with added environmental benefits through carbon recycling.

- Key barriers include lack of technical expertise, high capital requirements, and infrastructure limitations.
- Integrating EOR into Pakistan’s upstream sector can reduce import dependency, enhance production sustainability, and fortify national energy security.

Plenary Talk-2:
Engr. Tahir Soomro Deputy Director and Oil Sector Coordinator, Ministry of Energy (Petroleum Division), Government of Pakistan.
Title: Energy Security of Pakistan: Prospects, Challenges and Recommendations

Abstract:

Pakistan's energy landscape for the fiscal year 2022-23 reveals a mix of trends and developments that are significantly impacting the nation's energy dynamics. It has historically relied on fossil fuels to meet the country's energy needs (in particular, natural gas and oil) which is undergoing a critical transition; the country is on the verge of an energy revolution. The strategic objectives in this period revolve around strengthening energy growth, energy efficiency, and strategically reducing dependence on imports. Such objectives not only promise a more consistent and diversified energy supply but can further help shore up stability in the economy. Indigenous energy production, contributing 61% i.e. 51 million tons of oil equivalent (MTOE) to the energy mix, is effectively complemented by substantial energy imports, accounting for the remaining 39% i.e. 33 MTOEs reflecting a balanced energy equation for Pakistan. This synergy between domestic production and imports is an important determinant of Pakistan's energy balance. During this period, Pakistan recorded a major commercial energy supply dynamics conversion, down from 94 to 83 MTOE compared to the previous year. This shift can be attributed to the contrasting performances of different energy sources. Notably, the supplies of nuclear and Hydel electricity recorded a significant year-on-year increase of 35.39% and 12.04% respectively, emphasizing the growing significance of clean and green

energy in Pakistan's power generation. Additionally, Liquefied Petroleum Gas (LPG) saw an increase of 2.59%, contributing to the diversification of energy sources. Conversely, several other energy sources experienced a decrease in supply. Overall, the primary commercial energy supply mix in 2022-23 witnessed a substantial decrease of 12.1%, primarily driven by a reduction in imports. Energy security remains a top priority of the government, with an emphasis on increasing self-reliance, to reduce dependence on imported fossil fuels. The government plans to enhance the low-cost, green, and clean energy in the form of Hydel power generation which demonstrates the commitment to diversify the energy mix and promote sustainability. To boost the domestic production and reduce reliance on imported resources for exploration and drilling, the government is focusing on auctioning of various offshore oil and gas exploration blocks. This move aims to attract investment and uncover potential reserves. Additionally, the government encourages the responsible use of natural gas resources to counter the challenges posed by diminished supplies. Together, these measures represent a cohesive strategy to improve energy production, tackle supply challenges, and delve into new opportunities for resource exploration and energy security in Pakistan.

Takeaway of the Talk:

- Pakistan is undergoing a strategic shift from fossil fuel dependency toward a more sustainable and diversified energy mix, signaling the onset of an energy revolution.
- Domestic energy production contributed 61% (51 MTOE), while imports filled the remaining 39% (33 MTOE), reflecting efforts toward energy self-sufficiency.

- A 12.1% reduction in total commercial energy supply (from 94 to 83 MTOE) was largely due to decreased imports, impacting overall availability.
- Notable increases in nuclear (+35.39%) and Hydel (+12.04%) highlight the expanding role of clean and renewable energy sources in the national energy portfolio.
- The rise in LPG (+2.59%) and emphasis on green energy indicate Pakistan’s effort to diversify and decarbonize its energy matrix.

(Session 2B of Day 1)

Session Chair: Engr. Muzaffar Ali Mahar

Session Secretary: Dr. Faisal Hussain Memon

Session Theme: Innovating for Energy Security: Bridging Traditional Exploration with Future-Forward Strategies, A Roadmap for Pakistan

Plenary Talk-1:
Mr. Syed Tariq Hasany Seasoned geoscientist and exploration leader subsurface technologies, Karachi
Title: From Legacy to Innovation: Leveraging Hydrocarbon Exploration Successes for Sustainable Economic Growth and Energy Security of Pakistan

Abstract:

The discovery of oil and gas reserves in the early 20th century transformed the Indus Basin, with over 1,300 wells drilled and 480 discoveries, including 64.4 TCF of gas and 1.25 billion barrels of oil, positioning Pakistan as a rising star in the global energy sector. The Sui gas field, with 13 TCF reserves, transformed Pakistan's industrialization, supported by rapid infrastructure development and subsequent discoveries in Sindh and Baluchistan. These achievements have elevated Pakistan's technical expertise, with professionals now contributing to global energy projects.

In mature basins like the Indus, exploring diverse geological formations alongside new basins such as Baluchistan, Makran Offshore, and Indus Offshore is critical. A balanced approach combining advanced geoscience, reservoir engineering, and high-quality 2D/3D seismic data, supported by modern acquisition, processing, and innovative drilling technologies, is key to maximizing exploration and development.

To enhance production from mature, declining, and heavy oil fields, deploy advanced Artificial Lift methods (ESPs, gas lift) alongside thermal techniques (steam injection, in-situ combustion) and chemical EOR. Combining innovative drilling, reservoir monitoring, hybrid approaches, and real-time data analytics can maximize recovery, and improve efficiency.

The industry's success has also highlighted the need for our universities and research institutes to serve as manufacturing units for future human resources. These institutions must train students with state-of-the-art technological knowledge and ensure they are well-versed in the latest industry developments to meet growing needs.

Takeaway of the Talk:

- Pakistan's hydrocarbon journey—marked by over 480 discoveries and significant reserves (64.4 TCF gas, 1.25 billion barrels oil)—has laid a strong foundation for energy-driven industrialization and technical excellence.
- Future growth hinges on exploring both mature Indus Basin formations and underexplored frontiers like Baluchistan, Makran Offshore, and Indus Offshore using high-resolution 2D/3D seismic surveys and modern drilling technologies.
- To counter declining fields and heavy oil challenges, the integration of Artificial Lift systems (ESPs, gas lift), thermal recovery (steam flooding, in-situ combustion), and chemical EOR is vital, supported by real-time reservoir monitoring and hybrid techniques.

- Embracing data-driven solutions and advanced reservoir engineering can significantly enhance exploration success, recovery efficiency, and reduce development costs.
- Universities must evolve as innovation hubs, equipping future professionals with cutting-edge skills in geoscience, data analytics, and energy technologies aligned with evolving industry demands.
- By leveraging legacy knowledge, embracing innovation, and strengthening academia-industry linkages, Pakistan can achieve sustainable economic growth and long-term energy security.

Plenary Talk-2:

Engr. Muzaffar Ali Mahar
Deputy Chief Engineer,
Pakistan Petroleum Limited, Karachi, Pakistan

Title: Navigating the Future of Energy: Market Dynamics, Unconventional Resources, and Sustainable Hydrocarbon Development

Abstract

The global energy landscape is undergoing rapid transformation, shaped by fluctuating market demands, geopolitical influences, and the growing push for sustainability. Oil and gas remain the backbone of global energy security, yet their supply dynamics are increasingly complex due to shifting policies, technological advancements, and the emergence of unconventional hydrocarbon resources. This talk delves into the evolving energy market, analyzing current trends in global crude oil and natural gas demand, supply chain disruptions, and the role of major producers in stabilizing energy prices.

A significant focus will be placed on unconventional resource exploitation, including shale gas, tight oil, and deepwater hydrocarbons. Technological innovations such as hydraulic fracturing, enhanced oil recovery (EOR), and digital oilfield solutions are revolutionizing hydrocarbon extraction while aiming to minimize environmental impact. Additionally, the discussion will explore strategies for reducing the carbon footprint of petroleum operations, incorporating carbon capture, utilization, and storage (CCUS), and improving energy efficiency in upstream and downstream sectors.

Furthermore, this session will assess the role of national energy policies in shaping the future of fossil fuels, particularly in the context of energy

security and the transition towards a diversified energy mix. By examining case studies from key oil and gas-producing nations, including Pakistan and the broader South Asian region, this talk will highlight the importance of sustainable resource development, industry-academia collaboration, and policy integration.

The session aims to provide a comprehensive outlook on the challenges and opportunities within the petroleum sector, offering insights into how the industry can navigate the dual objectives of meeting global energy demand while progressing towards a low-carbon future.

Takeaway of the Talk:

- The energy sector is facing unprecedented transformation due to geopolitical shifts, volatile markets, and the urgent call for sustainability. Oil and gas remain central to energy security but require adaptive strategies in the face of changing global dynamics.
- Unconventional resources—shale gas, tight oil, and deepwater hydrocarbons—are reshaping global supply capabilities. Advances in hydraulic fracturing, EOR, and digital oilfield technologies are key enablers of this shift.
- : Emphasis on lowering environmental impact through innovations like Carbon Capture, Utilization, and Storage (CCUS), energy efficiency improvements, and environmentally responsible upstream and downstream practices.
- National energy policies will play a decisive role in balancing fossil fuel development with the global transition toward cleaner energy sources. Countries like Pakistan must align policy, technology, and investment for resilient energy systems.

- South Asia, especially Pakistan, holds strategic importance due to untapped unconventional reserves. The region must prioritize sustainable development, enhanced recovery techniques, and policy frameworks to ensure energy security.
- Achieving a sustainable hydrocarbon future requires synergy among government, industry, and academia—integrating innovation, investment, and regulation to meet global energy demands while progressing toward decarbonization.

(Session 2C of Day 1)

Session Chair: Dr. Dur Muhammad Soomro

Session Secretary: Engr. Imran Ali Memon

Session Theme: Towards Energy Security: The Role of Regional Cooperation and Renewables in South Asia

Plenary Talk-1:
Dr. Kashif Hussain Mangi Academician specializing, Engineering Management, and Sustainability Berlin School of Business and Innovation, Germany
Title: South Asian Energy Landscapes: Regional Perspective on Pakistan's Energy Transition and the Role of Renewable Energy Integration

Abstract:

South Asia’s energy landscape is deeply fragmented. India, despite coal dominance (55%), has scaled solar capacity to 73 GW through competitive auctions and policy consistency. Bangladesh achieved 95% electrification via decentralized solar home systems, while Nepal and Bhutan export hydropower to stabilize revenues (IEA, 2023; ADB, 2023). In contrast, Pakistan’s RE growth is stifled by institutional inertia, grid limitations, and fossil fuel subsidies—issues compounded by climate shocks, such as declining hydropower output (30% drop at Tarbela Dam in 2022) and heatwave-driven demand spikes (NEPRA, 2023). Pakistan's persistent energy crisis, characterized by significant power deficits (6-8 GW), substantial circular debt (PKR 2.6 trillion), and a heavy reliance on imported fossil fuels (67% of the energy mix), reflects broader energy challenges across South Asia. This study conducts a comparative analysis of Pakistan's energy sector within the regional context, contrasting its limited renewable energy (RE) integration (4%) with the advancements

of neighbouring nations, including India (38% RE), Nepal (92% hydropower), and Bhutan (99% hydropower). Despite Pakistan's substantial solar (2.9 million MW) and wind (50,000 MW in Sindh) potential, regional exemplars demonstrate viable pathways towards energy security. This analysis investigates the factors hindering Pakistan's RE adoption, including institutional inertia, grid infrastructure limitations, and entrenched fossil fuel subsidies, exacerbated by climate-induced shocks such as reduced hydropower output and heatwave-driven demand spikes. The critical regional comparison reveals policy inconsistencies, such as fluctuating solar tariffs and inadequate decentralized energy models, as key impediments. Conversely, successful regional initiatives, including India's competitive auction mechanisms, Bangladesh's micro financed solar home systems, and Nepal's cross-border hydropower trade, offer valuable insights. Quantitative and graphical data highlight stark disparities in rural energy access and RE deployment. Given these challenges, it is necessary to, this study advocates for the adoption of regional best practices, grid modernization, the phasing out of fossil fuel subsidies (PKR 500 billion/year), and the prioritization of decentralized RE solutions. This transition necessitates strong political will, regional collaboration (e.g., CASA-1000 grid), and equitable policies to transform Pakistan's energy sector. By leveraging lessons from South Asia's successes and failures, this analysis underscores the critical role of RE integration as a socio-economic imperative for Pakistan's sustainable development.

Takeaway of the Talk:

- South Asia offers contrasting energy trajectories—India, Bangladesh, Nepal, and Bhutan have made significant strides in renewable energy (RE) adoption, while Pakistan lags behind despite vast untapped potential.

- Chronic issues including a 6–8 GW power shortfall, circular debt of PKR 2.6 trillion, and a 67% dependence on imported fossil fuels underscore the urgency of energy transition.
- With only 4% RE in its energy mix—compared to India's 38% and Nepal/Bhutan’s >90% hydropower—Pakistan underutilizes its immense solar (2.9 million MW) and wind (50,000 MW) resources.
- Key constraints include policy inconsistency, weak grid infrastructure, fossil fuel subsidies (PKR 500 billion/year), and institutional inertia, further worsened by climate shocks (e.g., 30% hydropower drop at Tarbela).
- Success stories such as India’s solar auctions, Bangladesh’s solar home systems, and Nepal’s cross-border hydro exports provide proven models Pakistan can adapt to its context.
- Pakistan must adopt regional best practices, prioritize grid modernization and decentralize RE systems, phase out fossil fuel subsidies, and strengthen regional collaboration (e.g., CASA-1000) to ensure energy security and sustainable development.
- Renewable energy integration isn’t just an environmental goal, it’s essential for economic stability, rural electrification, and resilience against climate vulnerability.

(Session 3A of Day 2)

Session Chair: Dr. Yusufu Abeid Chande Jande
Session Secretary: Dr. Dur Muhammad Soomro
Session Theme: Innovating for a Sustainable Future: Optimizing Water Purification and Energy Systems

Plenary Talk-1:
Dr. Yusufu Abeid Chande Jande Associate Professor, Material Science and Engineering Nelson Mandela African Institution of Science, Tanzania.
Title: Do We Have the Right Choice of Water Purification Technology?

Abstract:

The concept of water purity started to be considered many years ago, before Jesus (Isa bin Mariam) was born. For example, between 14000 and 8000 BC during the neolithic age in Japan clay-fired pottery (containing mica, iron, and aluminum) were used in water purification when water was stored in those kinds of vessels. From century to century the level of technology and water quality standards (national or international standards like that of World Health Organization) has been advancing. The water source quality dictates the appropriate technology to be used as it is directly related to the intended contaminant/pollutant to be removed, most important is the consideration of the capital and operational cost. The water purification technologies range from thermally based to non-thermally based technologies. The thermally based technologies involve the use of heat, which means the source of energy is very important to consider as it is an energy intensive process. For example, it is worth adding thermally based water purifiers in some power plants in which the waste heat can be used in improving the

quality of the water. The non-thermally based water purification technologies are of various types, i.e. membrane based (with or without high pressure) and non-membrane based (with power or without power). It is crucial to choose the proper water purification technology based on the type pollutants, production capacity, and energy requirements, and associated costs (both operational and capital cost).

Takeaway of the Talk:

- Water purification is not new—ancient civilizations like Neolithic Japan used clay-fired pottery for water storage and natural purification, highlighting humanity's long-standing pursuit of clean water.
- Water treatment methods have evolved significantly, driven by rising water quality standards (e.g., WHO guidelines), new contaminants, and modern engineering innovations.
- The quality and type of water source critically influence the selection of purification technology. Each contaminant type demands specific removal strategies, making a one-size-fits-all approach impractical.
- Capital investment, operational cost, energy availability, and maintenance demands are pivotal in determining technology appropriateness, especially in resource-constrained settings.
- There is no universally best water purification technology. The “right choice” depends on matching the technology to the source water quality, specific contaminants, treatment goals, available energy, and overall cost feasibility.

Plenary Talk-2:
Dr. Dur Muhammad Soomro Associate Professor, Department of Electrical Engineering, DHA Suffa University Karachi, Pakistan.
Title: Innovative Solutions for Energy and Water Challenges for Sustainability Aligned with Sustainable Development Goals – SDGs

Abstract:

Energy and water are the twin pillars of sustainable development, playing a crucial role in economic growth, environmental preservation, and social well-being. However, increasing global demand, resource depletion, and climate change have intensified the challenges of ensuring energy security and water sustainability. This talk explores innovative solutions for addressing these challenges through emerging technologies, policy frameworks, and interdisciplinary research, aligning with the United Nations Sustainable Development Goals (SDGs) particularly SDG 6 (Clean Water and Sanitation) and SDG 7 (Affordable and Clean Energy). The discussion will highlight advancements in unconventional hydrocarbon recovery, enhanced oil recovery (EOR), and well cementing technologies, emphasizing their role in minimizing environmental footprints while ensuring energy efficiency. Additionally, sustainable water management practices, including advanced filtration, desalination, and water recycling methods, will be explored as viable solutions for meeting industrial and community water needs. Furthermore, the talk will underscore the significance of research, innovation, and policy integration in fostering sustainable solutions for energy and water challenges. Special attention will be given to regional perspectives, including Pakistan's ongoing efforts to enhance laboratory research, academic collaborations, and industry-academia partnerships to drive sustainable energy and water solutions. By bridging the gap between technology, sustainability, and policy, this

session aims to provide insights into practical pathways for achieving a balanced, resource-efficient future while advancing the SDGs.

Takeaway of the Talk:

- Sustainable energy and water access are essential for achieving economic resilience, social equity, and environmental protection—directly supporting SDG 6 (Clean Water and Sanitation) and SDG 7 (Affordable and Clean Energy).
- Innovative technologies such as Enhanced Oil Recovery (EOR), low-impact well cementing, desalination, advanced filtration, and wastewater recycling are pivotal in addressing rising demand while minimizing environmental impact.
- Long-term sustainability demands a unified approach combining cutting-edge research, forward-thinking policy, and real-world implementation, especially in water-stressed and energy-deficient regions.
- Countries like Pakistan are investing in laboratory infrastructure, academia-industry collaboration, and policy alignment to develop localized, scalable solutions that contribute meaningfully to global SDG targets.
- Solving energy and water challenges requires collaboration across engineering, environmental sciences, economics, and governance to ensure technologies are not only effective but also accessible and equitable.

(Session 3B of Day 2)

Session Chair: Dr. Mujeeb Iqbal Soomro

Session Secretary: Engr. Abdul Samad

Session Theme: Innovative Approaches to Reservoir Characterization and Fluid Flow Analysis

Plenary Talk-1:
Prof. Dr. Nasir Golsanami Professor, College of Energy and Mining Engineering Shandong University of Science and Technology, China.
Title: Multidimensional Processing of Conventional Scanning Electron Microscopy Images: Insights into Better Understanding of the Reservoir Fluid Flow Behavior

Abstract:

In this study, we introduce a novel technique for depth-slicing two-dimensional (2D) SEM images, enabling three-dimensional (3D) processing of conventional SEM data. This method allows for the analysis of phenomena occurring at different depths within the images. While 3D FIB-SEM imaging is a well-known technique, it is important to note that most existing SEM recordings are 2D images. This is because FIB-SEM is a relatively new and expensive method, often unavailable and not applicable to pre-existing 2D SEM datasets. Additionally, most laboratory equipment currently in use is still limited to capturing 2D images.

Our 3D depth-slicing technique involves extracting depth information from 2D SEM images using the joint analysis of grayscale density plus the phenomenon distribution pattern, followed by pixel clustering and mineral grouping and pore-fracture identification based on their apparent depth. This approach provides a cost-effective and accessible

alternative for obtaining 3D insights from conventional 2D SEM images, offering valuable implications for understanding reservoir fluid flow behavior.

Takeaway of the Talk:

- A novel image-processing approach has been developed that allows extraction of three-dimensional depth information from widely available 2D SEM images, overcoming the cost and accessibility limitations of FIB-SEM.
- The method employs grayscale density evaluation, pattern distribution analysis, pixel clustering, and mineral-pore-fracture segmentation to derive spatial depth variations, enhancing interpretation of microstructural features.
- By reconstructing a pseudo-3D understanding of pore structures and fracture networks, this technique provides more accurate insights into fluid pathways and flow behavior within reservoir rocks.
- This technique enables researchers and engineers to reprocess legacy SEM datasets, maximizing the utility of existing 2D data without the need for expensive 3D imaging equipment.
- The enhanced visualization and interpretation of reservoir microstructure can inform better decision-making in reservoir engineering, EOR planning, and unconventional resource development.

(Session 3C of Day 2)

Session Chair: Dr. Aqeel Ahmed Bhutto
Session Secretary: Engr. Muhammad Furqan Qureshi
Session Theme: Advancing Sustainability through the Use of Nanomaterials in Energy Solutions

Plenary Talk-1:
Engr. Muhammad Furqan Qureshi Senior Engineer at Rutledge Omni Services PTE LTD
Title: Wastewater-Derived Nanomaterials for Energy Applications: An Innovative Approach to Sustainability

Abstract:

The transition to sustainable energy solutions necessitates the integration of circular economy principles to optimize resource utilization while mitigating environmental challenges. This study explores the potential of wastewater-derived nanomaterials as an innovative solution for enhancing energy storage, improved oil recovery (IOR), and hydrogen geo-storage. Specifically, it investigates the wettability alteration of carbonate rock formations using alumina nanofluids and methylene blue (MB), a prevalent industrial dye found in wastewater from pharmaceutical, textile, and food industries. While MB contamination poses a significant environmental threat, its utilization in engineered nanofluids presents a dual-purpose strategy for environmental remediation and energy optimization.

This research evaluates the wettability modification of Sui Main Limestone (SML) core samples treated with alumina nanofluids (0, 0.05, 0.3, 0.50, 0.75, and 1.0 wt.%) and MB solutions (10, 15, 30, 50, and 100 mg/L) under controlled thermal conditions (25°C and 50°C) over a 7-day exposure period. The results demonstrate a significant shift from an oil-wet to a water-wet state, highlighting the efficacy of wastewater-derived nanomaterials in optimizing rock-fluid interactions for sustainable energy recovery and storage. By repurposing industrial wastewater into functional nanomaterials, this study presents an innovative pathway for addressing energy and water challenges through circular economy-driven solutions. The findings emphasize the transformative potential of integrating environmental sustainability with advanced energy technologies, paving the way for greener and more efficient resource management strategies.

Takeaway of the Talk:

- A new technique converts 2D SEM images into pseudo-3D, revealing depth-related phenomena.
- This method provides a cost-effective alternative to expensive FIB-SEM, using existing 2D SEM data.
- It combines grayscale density, pattern analysis, and pixel clustering to capture depth variations and microstructural details.
- The technique improves the understanding of pore structures and fractures, aiding fluid flow analysis in reservoirs.
- Researchers can reprocess legacy 2D SEM data for better reservoir characterization without needing 3D imaging tools.

(Session 3D of Day 2)

Session Chair: Prof. Dr. Manthar Ali Keerio

Session Secretary: Dr. Yasir Niaz

Session Theme: Smart Technologies and Clean Energy Innovations for Sustainable Resource Management

Plenary Talk-1:
Engr. Dr. Yasir Niaz Associate Professor and Associate Dean of the Faculty of Mechanical and Agricultural Engineering Khwaja Fareed University of Engineering and Information Technology, Rahimyar Khan
Title: Water Productivity Enhancement Using Sensor Technology

Abstract:

Effective irrigation scheduling plays an important role for water management at a field scale. Therefore, this research provided evidence for efficiently utilizing irrigation supplies through sensor-based systems. In this regard, eight (8) WiFi sensors were installed at the various locations in the district Rahim Yar Khan. The basic information and initial data that was collected during the installation campaign was managed using the Kobo Toolbox. The data includes crop and soil type, location of sensors installation, field boundary, allocated irrigation time, farmer's detail etc. During the field visit, farmers were provided training for the operation of sensors and scheduling their irrigation plan accordingly. Sensors were claimed using the VIA website and all relevant information was added on the website to monitor the data remotely. The map of the location for the sensors was prepared in QGIS. This report also provides interesting insight into the irrigation schedule followed by different farmers. Analysis of the sensor's data reveals that the irrigation was

provided relatively at drier conditions during the later crop stages and vice versa. Most farmers irrigated their fields during the moist condition. It is noteworthy to mention that the fields irrigated during moist or dry conditions resulted in higher crop productivity. These results reveal that irrigation scheduling based on soil moisture sensors have significant potential for water saving and increasing crop and water productivity.

Takeaway of the Talk

- The use of WiFi soil moisture sensors demonstrated precise irrigation scheduling, improving both water use efficiency and crop productivity.
- Kobo Toolbox facilitated organized data management—covering crop types, soil conditions, and field boundaries—while VIA enabled real-time monitoring.
- Capacity-building sessions empowered farmers to interpret sensor data and optimize irrigation practices accordingly.
- QGIS mapping of sensor locations enhanced understanding of spatial variability in irrigation needs.
- Soil moisture sensor-based irrigation scheduling is a practical, scalable, and sustainable approach to enhancing water productivity in agriculture, particularly in regions facing water scarcity.
- Smart irrigation driven by sensor technology can bridge the gap between water conservation and food security.

Recommendation of Conference

Recommendations of 1st International Conference on Exploring Innovative Solutions for Energy and Water Challenges for Sustainability (ICEWS 2025) held on April 16-17, 2025, at Mehran University of Engineering and Technology (MUET), Shaheed Zulfiqar Ali Bhutto Campus, Khairpur Mir’s, Pakistan.

The Department of Petroleum & Natural Gas Engineering, Mehran University of Engineering and Technology, Shaheed Zulfiqar Ali Bhutto Campus, Khairpur Mir’s, in collaboration with Benazir Bhutto Shaheed University of Technology and Skill Development, Khairpur Mir’s, and sponsored by the Sindh Higher Education Commission, Oil and Gas Development Company Limited (OGDCL) and Pakistan Petroleum limited (PPL), Pakistan, organized the International Conference on Exploring Innovative Solutions for Energy and Water Challenges for Sustainability.

The 1st International Conference on Exploring Innovative Solutions for Energy and Water Challenges concluded with a series of actionable recommendations aimed at setting actionable recommendations aimed at addressing solutions for energy and water challenges and promoting sustainable development. These recommendations emphasize a comprehensive and collaborative approach, involving policy reforms, cutting-edge technological advancements, and policy-driven initiatives to drive sustainable development across sectors. Below is the consolidated list of recommendations:

1. Green Hydrogen & Emerging Fuels

- **Establish Demonstration Hubs:** Launch pilot green hydrogen production facilities in Sindh and Punjab, inspired by Malaysia's successful electrolysis projects.

- **Policy Incentives:** Advocate for government subsidies and fiscal incentives to attract private investment in green hydrogen technologies.
- **International Partnerships:** Forge Memorandums of Understanding (MoUs) with global leaders in hydrogen technology for knowledge transfer and joint R&D collaborations.

2. Advanced Water Purification & Circular Economy

- **Community Water Kiosks:** Deploy rural water kiosks incorporating natural coagulants alongside membrane filtration and UV treatment technologies to improve rural water access.
- **Wastewater Recycling & Management:** Establish advanced nanotech filtration and membrane systems to recycle municipal and industrial wastewater for agricultural and industrial reuse.
- **Zero-Plastic Waste Initiatives:** Launch city-wide initiatives to eliminate plastic waste and reduce water pollution.
- **Effluent Treatment Enhancement:** Improve industrial and urban effluent treatment systems to ensure clean water availability.
- **Managed Aquifer Recharge (MAR):** Capture monsoon runoff and store it in aquifers via sensor-monitored recharge wells, ensuring a stable groundwater supply during dry seasons.
- **Salinity Gradient Power Modules:** Integrate CDI (Capacitive Deionization) systems with salinity gradient energy harvesting to reduce energy consumption in coastal desalination processes.

3. Digital & Sensor Technologies for Water and Energy

- **Smart Irrigation Networks:** Implement IoT-based soil moisture sensors and automated irrigation systems in key agricultural zones, with a mobile app dashboard for real-time monitoring.

- **AI Energy Control Centers:** Pilot AI-powered energy management systems to optimize load forecasting, grid operations, and fault detection.
- **Real-Time Water Monitoring:** Deploy sensor arrays in urban water supply networks for real-time leak detection, demand forecasting, and efficient water management.

4. Reservoir Characterization & Enhanced Oil Recovery (EOR)

- **Digital Lab Facilities:** Develop university-industry collaborations for advanced 3D SEM pore network modeling to optimize oil field development strategies.
- **CO_2 EOR Pilots:** Launch CO_2 injection trials in collaboration with OGDCL and PPL to enhance recovery in mature oil fields, supported by carbon credit initiatives.
- **Thermal EOR Trials:** Conduct trials using steam and microbial methods in high-viscosity reservoirs to improve recovery rates.

5. Sustainability & Inclusivity

- **Resource Efficiency:** Implement energy-efficient systems, water conservation techniques, and sustainable building materials to minimize environmental impact and ensure the longevity of resources.
- **Eco-friendly Design:** Prioritize sustainable architectural and urban designs that lower carbon footprints, integrate renewable energy sources, and create green spaces in cities.
- **Inclusive Access:** Ensure all environments are accessible, using universal design principles to accommodate individuals with diverse needs, including those with disabilities.

6. Collaboration and Monitoring

- **Alignment with Global Goals:** Align local initiatives with international frameworks such as the Sustainable Development Goals (SDGs) and COP agreements.
- **National Task Force on Climate and Nutrition Security:** Establish a task force to monitor and implement policies addressing energy and wather challenges.
- **Multi-Stakeholder Collaboration:** Foster collaboration between governments, private sector, and civil society organizations to ensure coordinated and effective implementation of policies.

Closing Ceremony

The 1st International Conference on Exploring Innovative Solutions for Energy and Water Challenges for Sustainability (ICEWS-2025) concluded on a high note with a grand Closing Ceremony, where distinguished guests and speakers shared their valuable insights.

Recommendations of the Conference

Prof. Dr. Syed Hyder Abbas Musavi, Director Academics at Mehran University of Engineering and Technology (MUET), SZAB Campus, Khairpur, shared his thoughtful recommendations during the 1st International Conference on Exploring Innovative Solutions for Energy and Water Challenges for Sustainability (ICEWS-2025).

Keynote Speakers Remarks

Insightful remarks were delivered by both international and national keynote speakers during the 1st International Conference on Exploring Innovative Solutions for Energy and Water Challenges for Sustainability (ICEWs-2025). The distinguished speakers included Prof. Dr. Rahisham Bin Abd Rahman, Associate Professor and Deputy Dean at the Center of Graduate Studies, Universiti Tun Hussein Onn Malaysia (UTHM); Dr. Yusufu Abeid Chande Jande, Associate Professor of Material Science and Engineering and Deputy Center Leader at the WISE-Futures Centre, Nelson Mandela African Institution of Science and Technology, Tanzania; Dr. Yasir Niaz, Associate Dean of the Faculty of Mechanical and Agricultural Engineering and Head of the Department of Agricultural Engineering at Khwaja Fareed University of Engineering and Information Technology, Pakistan; and Engr. Muzaffar Hussain, Deputy Chief Engineer (Production) at Pakistan Petroleum Limited, Karachi.

Chief Guest

Prof. Dr. Rasool Bux Mahar, Vice Chancellor of Benazir Bhutto Shaheed University of Technology and Skill Development, Khairpur Mir's, honored the 1st International Conference on Exploring Innovative Solutions for Energy and Water Challenges for Sustainability (ICEWs-2025) as the Chief Guest.

Concluding Remarks and Vote of Thanks

Engr. Abdul Samad, Conference Co-Secretary of ICEWS-2025, delivered the concluding remarks and vote of thanks at the Closing Ceremony of the 1st International Conference on Exploring Innovative Solutions for Energy and Water Challenges for Sustainability (ICEWS-2025)

Recommendation of the Conference by Prof. Dr. Syed Hyder Abbas Musavi

Prof. Dr. Syed Hyder Abbas Musavi, Director Academics at Mehran University of Engineering and Technology (MUET), Shaheed ZA Bhutto Campus, Khairpur, shared his insightful recommendations during the 1st International Conference on Exploring Innovative Solutions for Energy and Water Challenges for Sustainability (ICEWs-2025). He emphasized the critical role of interdisciplinary research in addressing global energy and water challenges, particularly through the integration of renewable energy technologies, sustainable water management, and efficient resource utilization.

Prof. Dr. Musavi stressed the importance of developing innovative and cost-effective energy solutions, including solar, wind, and bioenergy technologies, to meet the growing demand for clean and sustainable energy. In the water sector, he recommended focusing on advanced water treatment, desalination technologies, and efficient water distribution systems to address water scarcity and improve access to clean water. Concluding his remarks, he commended the conference for providing a platform that fosters knowledge exchange and collaboration and expressed his optimism about its potential to contribute significantly to sustainable development in the energy and water sectors.

Keynote Remarks by Prof. Dr. Rahisham Bin Abd Rahman

At the Closing Ceremony of the 1st International Conference on Exploring Innovative Solutions for Energy and Water Challenges for Sustainability, Prof. Dr. Rahisham Bin Abd Rahman, Associate Professor and Deputy Dean at the Center of Graduate Studies, Universiti Tun Hussein Onn Malaysia (UTHM), delivered impactful keynote remarks on energy solutions. Prof. Dr. Rahisham emphasized the transformative potential of hydrogen as a clean, versatile, and scalable energy carrier. He discussed advancements in green hydrogen production, the need for supportive policies, and the importance of regional and global collaboration to scale up infrastructure and investment. He highlighted that green hydrogen is not only a pathway to decarbonize industries but also a key element in achieving net-zero emissions and ensuring energy security. Concluding his keynote, Prof. Dr. Rahisham commended the conference organizers for bringing together a diverse group of researchers, engineers, and professionals to address pressing global challenges. He expressed confidence that ICEWs-2025 would inspire future research collaborations and accelerate the deployment of sustainable energy technologies worldwide.

Keynote Remarks by Dr. Yusufu Abeid Chande Jande

Dr. Yusufu Abeid Chande Jande, Associate Professor of Materials Science and Engineering and Deputy Center Leader at WISE-Futures, Nelson Mandela African Institution of Science and Technology, delivered an inspiring keynote on water and energy sustainability. Dr. Yusufu highlighted the urgent need to optimize water purification technologies and develop integrated energy systems to support growing global demands. He stressed the role of advanced materials and nanotechnology in improving filtration efficiency and reducing energy consumption in water treatment. He also emphasized innovative, low-cost energy solutions suitable for remote and underserved regions, advocating for cross-disciplinary collaboration to drive scalable and sustainable impacts. Concluding his remarks, Dr. Yusufu praised ICEWs-2025 for providing a dynamic platform for knowledge exchange and encouraged continued international cooperation in research and technology development for a more sustainable future.

Keynote Remarks by Dr. Yasir Niaz

Dr. Yasir Niaz, Associate Dean, delivered impactful keynote remarks on sustainable resource management. In the keynote address he underscored that the future of sustainable development depends heavily on the integration of smart technologies and clean energy solutions across all resource-intensive sectors. He emphasized that smart technologies like remote monitoring, automation, and clean energy systems are playing a key role in improving how we manage energy and water resources, especially in agriculture and rural areas where efficiency and sustainability are critical. He highlighted the necessity of bridging the gap between research and real-world application, urging stakeholders to accelerate the deployment of practical, cost-effective solutions. Dr. Yasir also called for stronger collaboration between academia, industry, and government to ensure that smart innovations translate into measurable impacts, especially in resource-stressed regions. In his concluding remarks, Dr. Yasir commended the ICEWs-2025 organizing team for creating a meaningful platform that brought together national and international experts. He expressed confidence that the conference will serve as a catalyst for impactful research, strategic partnerships, and actionable innovations that contribute to a sustainable and resilient future.

Keynote Remarks by Engr. Muzaffar Hussain

Engr. Muzaffar Hussain, Deputy Chief Engineer (Production) at Pakistan Petroleum Limited (PPL), Karachi, delivered a thought-provoking keynote address for energy security. In his remarks, Engr. Muzaffar highlighted the urgent need for Pakistan to strengthen its energy security by integrating modern technologies with conventional oil and gas exploration practices. He emphasized that while fossil fuels remain a key part of the national energy mix, it is essential to adopt digital tools, data analytics, and low-carbon strategies to ensure long-term sustainability and efficiency in exploration and production. He pointed to the importance of capacity building, regulatory support, and industry-academia collaboration to foster innovation and attract investment in both conventional and emerging energy sectors. Engr. Muzaffar also called for a balanced roadmap that not only enhances domestic production but also accelerates the adoption of renewables, hydrogen, and advanced storage solutions. Concluding his keynote, he appreciated the efforts of the ICEWs-2025 organizers for bringing together experts from diverse fields and expressed optimism that such platforms will help shape Pakistan’s energy future through innovation, policy guidance, and collaboration.

Address by the Chief Guest

Prof. Dr. Rasool Bux Mahar, Chief Guest of the Closing Ceremony of ICEWS-2025, highlighted the critical importance of water as a cornerstone of sustainable development. He emphasized that water management, purification, and responsible utilization are urgent needs in the face of climate change and increasing demand. Stressing water’s role in economic growth, agriculture, and public health, he called for innovative approaches and technologies for efficient use and treatment.

He highlighted that water is not just a natural resource but a critical element for life, health, economic development, and environmental stability. Prof. Mahar emphasized that Pakistan, like many developing nations, faces growing water scarcity, pollution, and inefficiencies in water management, which threaten food security, energy production, and overall human well-being. He stressed that ensuring access to clean and safe water must be treated as a national priority. In his remarks, he underscored the need for adopting advanced water purification technologies, efficient usage practices, and infrastructure development that supports sustainable water distribution and conservation. He also pointed out the importance of raising public awareness and implementing strong policy frameworks to support these efforts.

Prof. Mahar appreciated the conference’s focus on integrated energy and water solutions and its contribution to knowledge-sharing among academia, industry, and policymakers. He acknowledged the significance of ICEWS-2025 in fostering dialogue and promoting interdisciplinary collaboration, particularly in addressing Pakistan's pressing water challenges. Concluding his remarks, he expressed optimism that the outcomes of the conference would lead to impactful research, practical solutions, and sustainable policy initiatives for water security in the region.

Address by the Pro- Vice Chancellor:

Prof. Dr. Dur Muhammad Pathan, Pro vice Chancellor, Mehran University of Engineering and Technology, SZAB Campus, Khairpur, extended his heartfelt gratitude to the Chief Guest, Guest of Honor, and all the esteemed national and international speakers for their valuable contributions. He praised the insightful presentations and thought-provoking discussions that enriched the intellectual depth of ICEWS-2025 and opened new pathways for collaboration and innovation. He also acknowledged the enthusiastic participation of attendees, whose active engagement and questions added vibrancy to every session. Their involvement transformed the conference into a dynamic forum for exchanging ideas, showcasing solutions, and fostering interdisciplinary dialogue. Reflecting on the themes of the conference, Prof. Pathan emphasized that energy and water are not just technical challenges but pressing global priorities linked directly to social well-being and sustainable development. He highlighted the need for integrated strategies that connect clean energy transitions, water conservation, and resilient infrastructure, especially for developing regions like Pakistan. He reiterated the importance of aligning research and innovation efforts with the United Nations Sustainable Development Goals (SDGs), particularly SDG 6 (Clean Water and Sanitation) and SDG 7 (Affordable and Clean Energy), to drive real-world impact.

Concluding his address, Prof. Dr. Pathan expressed deep satisfaction with the successful execution of ICEWs-2025, noting that the conference has not only met but exceeded its objectives. He affirmed that the outcomes of this event would serve as a foundation for future collaboration, innovation, and impactful research in the fields of energy and water sustainability. With optimism and gratitude, he declared the conference officially closed, expressing hope that the dialogue initiated at ICEWs-2025 would continue to inspire change and shape a more sustainable future.

Concluding Remarks and Vote of Thanks by Engr. Abdul Samad Shaikh:

The event concluded with a Vote of Thanks by Engr. Abdul Samad, Conference Co-Secretary of the 1st International Conference on Exploring Innovative Solutions for Energy and Water Challenges for Sustainability (ICEWS-2025). Engr. Abdul Samad expressed heartfelt gratitude to the Chief Guest, Guest of Honor, keynote speakers, distinguished researchers, industry professionals, and all participants for their invaluable contributions, which made the conference a resounding success.

He acknowledged the significance of the diverse ideas shared throughout the sessions, which spanned clean energy, water purification, smart technologies, and sustainable development. These contributions, he noted, had enriched academic and professional dialogue and helped shape a meaningful path toward innovative solutions in the energy and water sectors. Engr. Abdul Samad also extended sincere appreciation to the organizing team, volunteers, and institutional leadership of Mehran University of Engineering and Technology, Shaheed ZA Bhutto Campus, Khairpur, for their tireless efforts and seamless coordination that ensured the smooth execution of ICEWS-2025. Concluding his remarks, Engr. Abdul Samad reaffirmed the commitment of the organizing team to continue hosting such knowledge-driven platforms. He expressed hope that ICEWS-2025 would serve as a springboard for future collaborations, research initiatives, and policy innovations aimed at securing a sustainable future. He wished all participants success in their endeavors and encouraged them to carry forward the spirit of cooperation and innovation fostered during the conference.

OPINING CEREMONY

1ST INTERNATIONAL CONFERENCE ON EXPLORING INNOVATIVE SOLUTIONS
FOR ENERGY AND WATER CHALLENGES FOR SUSTAINABILITY
ICEWS25

1ST INTERNATIONAL CONFERENCE ON EXPLORING INNOVATIVE SOLUTIONS
FOR ENERGY AND WATER CHALLENGES FOR SUSTAINABILITY
"Unlock The Energy & Water Resources, Meeting Marketing Demands"
ICEWS25

1ST INTERNATIONAL CONFERENCE ON EXPLORING INNOVATIVE SOLUTIONS
FOR ENERGY AND WATER CHALLENGES FOR SUSTAINABILITY
ICEWS25

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FOR ENERGY AND WATER CHALLENGES FOR SUSTAINABILITY

ICEWS25
1st International Conference on
EXPLORING INNOVATIVE SOLUTIONS FOR ENERGY AND WATER CHALLENGES FOR SUSTAINABILITY
(16-17 April, 2025)
OUR INTERNATIONAL AND NATIONAL KEYNOTE SPEAKERS

Plenary sessions (At Main auditorium)

Comparative Analysis of Energy Mix of Pakistan
1ST INTERNATIONAL CONFERENCE ON EXPLORING INNOVATIVE SOLUTIONS FOR ENERGY AND WATER CHALLENGES FOR SUSTAINABILITY
"Unlock The Energy & Water Resources: Meeting Marketing Demands"
16-17, April 2025
ICEWS25 International Conference
1st International Conference on EXPLORING INNOVATIVE SOLUTIONS

1ST INTERNATIONAL CONFERENCE ON EXPLORING INNOVATIVE SOLUTIONS
FOR ENERGY AND WATER CHALLENGES FOR SUSTAINABILITY
16-17 April 2025
MUET, SHAHEED Z.A. BHUTTO CAMPUS KHAIRPUR MIRS
ICEWS25 International Conference

Plenary sessions (At video conference hall, Central Library)

1ST INTERNATIONAL CONFERENCE ON
EXPLORING INNOVATIVE SOLUTIONS FOR ENERGY AND WATER CHALLENGES FOR SUSTAINABILITY
15TH-17TH APRIL 2025
ABOUT ICEWS 2025
SCOPE
ORGANIZED BY
DEPARTMENT OF PETROLEUM & NATURAL GAS
CERTIFICATE
Mr. Shakir Ali Khokhar
Presenter

Plenary sessions (At SIREN Room)

Scope of Project

Scope of Project

Introduction
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Scope of Project

Optimizing Enhanced Oil Recovery with Nanoparti
The Influence of Silica (SiO₂) and Magnesium Oxide (MgO) on Rese
Presented
by
Engr. Ishfaque Ali
Mehran University Of
Engineering and Technology
Jamshoro , sindh
1st International Conference on Exploring Innovative Solutions for Energy and W
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1st International Conference on Exploring Innovative Solutions for Energy and W
(ICEWS-2025)

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Plenary session (BBSUTSD)

1ST INTERNATIONAL CONFERENCE ON EXPLORING INNOVATIVE SOLUTIONS FOR ENERGY AND WATER CHALLENGES FOR SUSTAINABILITY
"Unlock The Energy & Water Resources: Meeting Marketing Demands"
16-17, April 2025
Organized by
In collaboration with
The Benazir Bhutto Shaheed University of Technology and Skill Development, Khairpur Mirs, Sindh, Pakistan
Sponsored by
The Benazir Bhutto Shaheed University of Technology and Skill Development, Khairpur Mirs

THE BENAZIR BHUTTO SHAHEED UNIVERSITY OF TECHNOLOGY AND SKILL DEVELOPMENT KHAIRPUR MIR'S

1ST INTERNATIONAL CONFERENCE ON EXPLORING INNOVATIVE SOLUTIONS FOR ENERGY AND WATER CHALLENGES FOR SUSTAINABILITY
"Unlock The Energy & Water Resources: Meeting Marketing Demands"
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VISITS

PETROLEUM & NATURAL GAS ENGINEERING DEPARTMENT
DEP
BASIC SCI

GAS ENGINEERING LABORATORY
GENERAL LAB INSTRUCTIONS

Gala Dinner

1ST INTERNATIONAL CONFERENCE ON EXPLORING INNOVATIVE SOLUTIONS
FOR ENERGY AND WATER CHALLENGES FOR SUSTAINABILITY
PRESENTS
MUSICAL GALA & DINNER
SINGER: FAHEEM ALLAN FAQEER
16th April 2025
Organized by
Department of Petroleum & Natural Gas Engineering
SZAB Campus, Khairpur Mir's
Sponsored by

1ST INTERNATIONAL CONFERENCE ON EXPLORING INNOVATIVE SOLUTIONS
FOR ENERGY AND WATER CHALLENGES FOR SUSTAINABILITY
PRESENTS
MUSICAL GALA & DINNER
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16th April 2025
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1ST INTERNATIONAL CONFERENCE ON EX
FOR ENERGY AND WATER CHALLE
PRESENTS

1ST INTERNATIONAL CONFERENCE ON EXPLORING INNO VE SOLUTIONS
FOR ENERGY AND WATER CHALLENGES FOR ITY
PRESENTS
SINGER: FAHEEM ALLAN FA
16th April
Organized by
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